

Patent Claims

1. Method for randomly storing data on data storage networks and/or an intranet and/or the Internet,

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characterized in that

a quantity of data blocks D_i ($i=1, \dots, m$) is allocated to a quantity of data storage systems S_j ($j=1, \dots, n$) pursuant to the following steps and stored there:

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a) a virtual storage space is allocated to an overall quantity of data storage systems and at least one partial space I_j of the virtual storage space to each individual data storage system S_j ($j=1, \dots, n$) by an initial random process, whereby the relationship between the partial space I_j and the overall virtual storage space at least approximately matches the relationship of the values of a presettable parameter relating to the data storage system S_j or the overall quantity of data storage systems,

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b) a (random) element $h(i)$ of the virtual storage space is allocated to each data block D_i ($i=1, \dots, m$) by means of a second random process,

c) for each data block D_i ($i=1, \dots, m$) at least one partial space I_k containing $h(i)$ is determined and the data block D_i is allocated to at least one of the data storage systems S_k represented by this (these) partial data space(s) I_k and stored there.

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2. Method according to one of the Claims 1, characterized in that with an initial and/or second random process pseudo-random functions are applied.

- 5 3. Method according to one of the Claims 1 or 2, characterized in that data storage systems S_j whose value c_j of the presettable parameter exceeds a second value δ that is also presettable, are

fragmented into $\left\lfloor \frac{c_j}{\delta} \right\rfloor$ new virtual data storage systems $S_{j'}$ with value $c_{j'} = \delta$ and – if $c_j = \left\lfloor \frac{c_j}{\delta} \right\rfloor$

$\cdot \delta \neq 0$ – into another virtual data storage system S_k with $c_k = c_j - \left\lfloor \frac{c_j}{\delta} \right\rfloor \cdot \delta$ and in each case at least one partial space $I_{j'}$ or I_k of the virtual storage space is allocated to these virtual data storage

- 10 systems by means of a random process, whereby $[a]$ describes the integral part of a number
 $a \in \mathbb{Z}$

4. Method according to one of the aforementioned Claims, characterized in that the virtual storage space is represented by the interval $[0, 1)$ and the partial spaces I_j by at least one partial interval
 15 contained in $[0, 1)$.

5. Method according to one of the aforementioned Claims, characterized in that

in the initial random process the left edge of the interval I_j is determined by the application of an initial hash function and the length of the interval is calculated in accordance with $(g(j) + s * c_j)$ with:

- 5 c_j : value of the parameter relating to the data storage system and
 s : stretch factor, selected in such a way that $s * c_j < 1$ is fulfilled.

6. Method according to one of the aforementioned Claims, characterized in that the stretch factor s is selected in a manner that the interval $[0, 1)$ is completely covered over by the partial intervals I_j .

10 7. Method according to one of the aforementioned Claims, characterized in that in the second random process a number $h(i) \in [0, 1)$ is allocated to each data block D_i ($i=1, \dots, m$) by means of the application of a second hash function $h(i)$.

15 8. Method according to one of the aforementioned Claims, characterized in that the presettable parameter

- describes the physical capacity of data storage systems or
- the request load of data storage systems or
- correct [sic] deviations from the desired distribution.

9. Method according to one of the aforementioned Claims, characterized in that in such a case that the element $h(i)$ allocated to a data block D_i is contained in multiple partial spaces I_j a uniform placement strategy is applied in order to allocate the data block D_i to one of the data storage spaces represented by the partial spaces I_j .
10. Method according to one of the aforementioned Claims, characterized in that with changes in at least one of the values $C = (c_1, \dots, c_n)$ of the presettable parameter, a repeated allocation of the data blocks S_j should be carried out in accordance with the method for randomly storing data pursuant to one of the Claims 1 through 9 while setting the new parameter values $C' = (c'_1, \dots, c'_n)$ as the basis.
11. Method according to one of the aforementioned Claims, characterized in that with changes in at least one of the values $C = (c_1, \dots, c_n)$ of the presettable parameter, a repeated allocation of the data blocks D_i to the data storage systems S_j is only carried out according to the method for randomly storing data pursuant to one of the Claims 1 through 9 while setting the new parameter values $C' = (c'_1, \dots, c'_n)$ as the basis if a new parameter value $c'_{i'}$ varies from the corresponding current parameter value $c_{i'}$ by a presettable constant μ .

12. Method according to one of the aforementioned Claims, characterized in that with changes in at least one of the values $C = (c_1, \dots, c_n)$ of the presettable parameter into a new parameter value $C' = (c'_1, \dots, c'_n)$ a repeated allocation of the data blocks D_i to the data storage spaces is carried out in stages S_j according to the method for randomly storing data pursuant to one of the Claims 1 through 9, whereby at each stage k intermediate parameter values $C^k = (c^k_1, \dots, c^k_n)$ with $|c_i - c^k_i| \neq |c_i - c'_i|$ ($i = 1, \dots, n$) are set as the basis.
13. Method according to one of the aforementioned Claims, characterized in that for storing data blocks in a storage medium at least one table should be prepared in which the allocation between virtual address and physical address on the storage medium is stored.
14. Method according to Claims 13, characterized in that multiple data blocks are summarized in an extent to which is allocated in the table a common physical address on the storage medium, whereby the data blocks of an extent are linked with each other in the logical address space by the first data block of an extent that consists of 2^λ obtaining an address in the form $x00\dots000$, whereby the lower λ bits are represented by the number zero, the

last block of this extent receives the address $x11\dots111$, whereby the lowest λ bits are represented by means of the number one, and the physical position of a data block is derived by means of an adding up of the table entry for the respective extent to the last λ bits of the logical address of the data block.

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15. Arrangement with at least one processor that is equipped in such a manner that a method for randomly storing data on storage networks and/or on an intranet and/or on the Internet is executable, whereby the randomized storage of data includes the steps of the method pursuant to one of the Claims 1 through 14.

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16. Arrangement according to Claim 15, characterized in that the arrangement includes
- at least one data storage medium and/or
 - at least one computer system that access(es) by reading and/or by writing to the storage media and/or
 - at least one controller unit switched in between the computer system(s) and the in between the computer system(s) and the method for randomly storing data.

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17. Arrangement according to Claim 16, characterized in that

the data storage system includes

- hard drive surfaces and/or
- intermediate storage spaces as web caches.

5 18. Arrangement according to one of the Claims 15 through 17, characterized in that the arrangement includes at least one controller unit switched in between the computer system(s) and the data storage system(s) for controlling the method of randomly storing data.

10 19. Arrangement according to Claim 18, characterized in that the arrangement at least includes computer system that accesses the storage media via the controller unit.

20. Arrangement according to one of the Claims 15 through 19, characterized in that the method for randomly storing data is implemented as a hardware RAID method in the controller unit.

15 21. Arrangement according to one of the Claims 15 through 20, characterized in that the arrangement includes

- at least one dedicated computer system (SAN appliance) that linked via data exchange

means with storage media and computer systems of the arrangement for coordinating the storing of data and/or

- processor resources (in-band appliances) linked via means for data exchange with storage media and computer systems of the arrangement for distribution of data blocks.

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22. Arrangement according to one of the Claims 15 through 21, characterized in that the arrangement includes heterogeneous storage media.

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23. Computer program product that includes a computer-readable storage medium on which is stored a program that enables a computer, once it has been loaded into the memory of the computer, to perform a method for randomly storing data on data networks and/or an intranet and/or the Internet, whereby the randomized data storage includes steps of the method pursuant to one of the Claims 1 through 14.

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24. Computer-readable storage medium, on which a program is stored that enables a computer, after it has been loaded into the memory of the computer, to perform a method for randomly storing data on storage networks and/or on an intranet and/or on the Internet, whereby the randomized data storage includes the steps of the method pursuant to one of the Claims 1 through 14.